

January 9, 1958

A Proposal for an Administrative Program
for the
Development of Rust-resistant Western White and Sugar Pines
and the
Development of Improved Strains of all Species

In the Pacific Northwest, there are more than one million acres not now in the blister rust control units which should be growing western white or sugar pines. On this acreage these two pines outgrow their associates by wide margins and produce more valuable wood as well. At present about 160,000 acres of non-restocked cutovers and burns well suited to these species are producing nothing. These lands will eventually revert to brush or to poorly stocked stands of less valuable and less productive species, unless rust-resistant pines become available. None of these areas can be managed for western white or sugar pine because of the white pine blister rust. Additional funds for blister rust control are not available and in any case costs would be prohibitive on many areas. With rust-resistant stock white pine management appears to be feasible and desirable. Rust-resistant stock also should be used on the 145,000 acres inside the present blister rust control units. Major reductions in costs would result.

Ultimately, we should only plant superior strains of all species. This is particularly true of our major species Douglas-fir and ponderosa pine. True-firs resistant to Chermes are highly desirable and eventually might be developed. The program in Region 1 has pointed the way to develop blister rust-resistant white pine and will produce stock in quantity within the foreseeable future. However, Region 1 will not be able to produce stock for our needs as well as their own. Moreover, we would not expect stock produced from parents in Region 1 to be as suitable for our use as stock produced from parents of local origin. Region 5 will ultimately start a program to produce rust-resistant sugar pine. They do not yet have one under way and when they do, they will be hard pressed to fill their own requirements.

To lay the foundation for production of enough blister rust-resistant stock for present and long-range needs in Region 6, a program embracing the necessary field selections, testing, and seed orchard establishment must be undertaken here. Accordingly and under the guidelines furnished us by personnel in Region 1, we have discovered 115 apparently rust-resistant white and sugar pines over a two-year period. This has amply demonstrated the occurrence of adequate suitable trees of local origin. This searching and testing to date has been done without special funds or personnel.

We will continue to look to Region 1 for the basic studies in the inheritance and nature of blister rust-resistance, as well as the technology of mass producing rust-resistant planting stock. Region 5 will do the basic work on hybrids and we will follow their leads and techniques. The Pacific Northwest Forest and Range Experiment Stations will provide technical assistance in the fields of pathology and genetics. The station should be able to provide the necessary

assistance in pathology, with their present financing for blister rust research. It would be highly desirable for the station, greatly to increase their assistance in the field of genetics.

We now have 19 plus trees of species, other than the white pines, hybrid pollination has been done on ten ponderosa pine and one seed orchard has been selected and is being developed.

This region now stands ready to start a program of locating additional superior trees of all species in addition to rust-resistant white pines, testing these trees, mass producing desirable hybrids and establishing enough seed orchards to furnish superior seed and planting stock needed on our national forests. In broad terms, it would be desirable to start this program with a forester in the Division of Timber Management and a research specialist in the Pacific Northwest Station. However, if the station is unable at this time to assign a man full time to the work, we are prepared to do the developmental work with such technical assistance as the station can provide with present personnel and financing.

The Bureau of Land Management is desirous of having rust-resistant stock for the 60,000 acres they are managing for sugar pine. They have offered \$500 to help finance the work plus assistance from their field personnel as agreed upon. The financing of the position in the Division of Timber Management would be from blister rust and planting funds.

The Forest Service has established itself in a strong position of leadership in this field mainly through the vitality of the effort in Region 1. This leadership can be strengthened if the Pacific Northwest as well as the other regions can follow out the leads they have developed. We are, therefore, submitting this memorandum asking for an effective program designed to meet the foreseeable needs in this region. A copy of project plan is attached.

Attachment

Project Plan
for
The Development and Improvement of Blister Rust-Resistant Strains
of
Western White and Sugar Pine
and
The Development and Improvement of Strains
of
Species Other than White or Sugar Pine

Purpose

- I. To produce for Region 6 sufficient western white pine and sugar pine planting stock or seed to grow trees with substantial resistance to white pine blister rust on sites where they are superior to other species in terms of growth and yield.
- II. To improve the strains of other species particularly Douglas-fir and ponderosa pine, and true firs through selection of superior seed sources and production of promising strains of hybrids developed by research.
- III. To test and produce under field conditions such exotics as are deemed desirable.

Scope

- I. White pines: It is estimated that on national forest lands in Region 6 and BLM lands in Oregon the white pines are more suitable than other species for the site on approximately 1,265,000 acres as shown below:

<u>Species</u>	<u>Class of Area</u>	<u>Acreage</u>
Western white pine	Now deforested	120,000
	Now in other species and mixed stands	575,000
		<u>695,000</u>
Sugar pine	Now deforested	40,000
	Now in other species and mixed stands	325,000
		<u>365,000</u>
Not now in white pine management		1,060,000 acres
Now in white pine management (blister rust control units).		

Western white pine	28,000
Sugar pine	<u>117,000</u>
	145,000
Sugar pine BLM lands	<u>60,000</u>
	205,000

Total acreage for white pine
management 1,265,000 acres

- II. Other species: Region 6 annual need for planting stock for 1959-60-61 is expected to reach the following levels:

<u>Species</u> (other than the white pine)	<u>M Planting Stock</u>	<u>Acres</u>
Douglas-fir	16,000	32,000
Ponderosa pine	5,000	10,000
Other species	<u>9,000</u>	<u>18,000</u>
	30,000	60,000 Acres

In the future the need will greatly increase. For the present as much seed from superior sources should be used as can be collected. Eventually all seed should be from superior strains.

Program

I. Rust-resistant white pines:

- A. Locate at least 150 each of apparently rust-resistant western white and sugar pine suitable for progeny tests.
- B. Test the ability of individual candidates to transmit rust resistance to progeny.
- C. Find at least 15 clones, capable of transmitting rust resistance, of each species for each planting zone.
- D. Establish seed orchards for production of enough F_1 seed to meet the region's need.
- E. Mass pollinate individual rust transmitters to increase resistance and to secure seed and planting stock for further testing and planting.

II. Species other than white pine

- A. Locate as many plus trees, particularly Douglas-fir and ponderosa pine as possible.
- B. Collect as much seed as possible from plus trees and stands.
- C. Establish seed orchards of superior strains of Douglas-fir and ponderosa pine.

- D. Test hybrids developed by the Institute of Forest Genetics at Placerville.
- E. Mass produce hybrid seed or planting stock adequate for our needs.

Organization

The overall direction of the project will be in the Division of Timber Management. Technical assistance, guidance and research on problems as they develop will be by the PNW Station.

Normal organizational lines are to be observed. A forester on the Timber Management staff is needed for:

1. Preparation of immediate and long range plans adequate to achieve the objectives.
2. Furnish leadership, guidance, training and assistance to the forests and nurseries.
3. To work with the PNW Station on the technical phases of the project.
4. To keep informed of research findings applicable to the problem and determine how and when to put such knowledge and techniques into general field practices.

Financing

1957-1960 Project leader's salary, travel and miscellaneous project expenses. \$12,000.

Financing will be shared equally by BR funds and planting funds and can be met from existing funds for F. Y. 1958. The Bureau of Land Management has offered to assist in financing to the extent of \$500 annually plus field assistance. The level of financing may need to be increased as the objectives are being reached and seed orchards are developed.

Status as of 1957

I. Development of blister rust-resistant strains of western white and sugar pines.

A. Candidates for rust-resistant transmitters

1. Western white pine	
(a) Umpqua NF	75
(b) Willamette NF	3
(c) Mt. Hood NF	6
(d) Mt. Rainier NF	8
Total	<u>92</u>

2. Sugar pine
 - (a) Rogue River NF 12
 - (b) Umpqua NF 4
 - (c) Medford District BLN 3

19

There are several sugar pine areas with a number of pine trees each that might be rust-resistant that have been localized and should on further search and closer examination yield more candidates for testing.

B. Release and application of fertilizer

All the sugar pine candidates have been released from competing vegetation where necessary and have had fertilizer applied to encourage early flowering and increased seed production. Some trees have been fenced and signed.

About half of the western white pine candidates have had fertilizer applied and where necessary have been released from competing vegetation to encourage seed production.

C. Seed Collections

In 1956, wind pollinated seed was gathered from 37 candidates on the Umpqua. Additional seed from some of these trees was collected in the fall of 1957. No sugar pine seed has as yet been collected.

D. Grafting

Several hundred western white and sugar pine seedlings have been potted and are being held for use as understock for grafting in 1958. Additional seedlings will be secured from the Wind River Nursery.

Rust-resistant grafts on hand ready for outplanting

- (1) Western white pine 29
- (2) Sugar pine 17 for R-6 70 for R-5

These grafts are now stored at a greenhouse at Prospect, Oregon and are being cared for by the Rogue River Forest.

E. Wind River Nursery

(1) Progeny tests.

Seed lots from 37 western white pine candidates were sown in a randomized design and will be artificially inoculated with blister rust in 1958.

(2) Seed beds for progeny testing.

An area has been selected and reserved for testing beds.

(3) Transplant area.

An area has been selected and reserved for use of transplanted stock.

(4) Outplanting area.

Some ground has been reserved and is being developed as an outplanting site for protection of rust-resistant plasm and use as an archive.

F. Outplanting sites

Sites have been selected at the Wind River Nursery for western white pine (see E-3 & 4 above) and at Mill Creek on the Rogue River for western white and sugar pine. Sites are being cleared and developed for use.

G. Seed orchards.

Mill Creek on the Rogue River N.F. tentatively has been selected for production of western white pine and sugar pine seed for use in southern Oregon. Wind River is under consideration for production of western white pine for the rest of the region.

II. Development of superior strains of species other than white or sugar pine.

A. Selected plus trees now known	19 trees
B. Hybrid pollination	10 trees
C. Seed orchards	5

Action plan

I. Development of rust-resistant strain of western white and sugar pine.

A.

<u>Nursery</u>	<u>Start</u>	<u>Years</u>	<u>Remarks</u>
(1) Test progeny of rust-resistant transmit candidates	1957	Continuous	Test Umpqua seed now sown. Stratify and sow all seed available in 1958 and 1959. Continue tests as seed is collected. (Technical assistance from PNW.)

(2) Transplant w.w.p. and SP seedlings for understock, grafting, etc.	1958 Spring	1958 and as needed	Put 500 western white pine and 2,000 sugar pine into transplant beds so that they can be either grafted in place or lifted and moved to the field for grafting.
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(3) Establish archives and outplanting sites	1958	continuous	Select areas for out-planting sites, plant grafted scions of rust-resistant candidates to protect plasm and have available for tests at Wind River. (Technical assistance from M.W.)
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(4) Select seed orchard sites	1958	1958	For production of white pine for all except southern Oregon.
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(5) Develop sites and establish seed orchards	1960	continuous	Start establishment as soon as tests indicate any candidate is a rust-resistant transmitter.
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B. Seed

(1) Collect seed from rust-resistant trees.	1956	continuous	Collect seed from individual rust-resistant candidates each year until tests are completed and seed orchards are in production.
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(2) Fertilizer application to candidates	1957	as needed	Apply fertilizer to candidates to encourage early seed production, to increase the amount and improve quality of the seed.
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(3) Controlled pollination	1958	1958-1973	In cooperation with PNW Station control pollinate between selected parents to secure seed for future tests to see if resistance is additive.
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C. Selection for Resistance

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|---|------|------------|---|
| (1) Find rust-resistance transmitter candidates | 1956 | 1956-1961 | Continue organized search for candidates until at least 150 each of WWP for southern Oregon, western white pine for northern zone and sugar pine are found. |
| (2) Care of candidates | 1957 | continuous | Release from competition, apply fertilizer, sign and where necessary fence. Continue as long as need for each individual remains. |
| (3) Preserve plasm | 1957 | 1957-1963 | Secure grafts from each candidate and move to outplantings to protect against loss of parent stocks. |
| (4) Test candidates for ability to transmit resistance to progeny | 1958 | 1958-1975 | Tests to continue until at least 15 clones of each species for each zone have been selected for the seed orchards. |
| (a) Wind pollinated seed. | 1958 | 1958-1973 | Will use artificial inoculation and natural inoculation both in testing. |
| (b) Controlled pollinated seed F_1 | 1960 | 1960-1975 | Test progeny from selected parents. Both artificial inoculations and natural inoculations to be used in tests. |
| (5) Outplanting sites | | | |
| (a) Selection | 1957 | 1957-1958 | Two are needed, one for sugar pine and western white pine for southern Oregon and one for western white pine for rest of Region 6. Sites should be selected for outplanting within the year. Mill Creek has been selected on the Rogue River Forest. Site near Wind River should be selected in 1958. |

(b) Preparation	1957	1957-1960	Both sites should be cleared and fenced by 1960. Expansion will follow as needed.
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D. Inter specific hybridization for resistance.

The basic work here is being done by the Institute of Forest Genetics at Placerville, California and is now under way. We will test resistant hybrids for adaptability on their recommendation.

E. <u>Seed orchards</u>	1958	continuous
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(1) Determine capacity	1958	1958-1959	Needs of the region should be assessed and seed production programmed on a long time basis.
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(2) Selection	1958	1958-1959	At least two needed; one for southern Oregon, one for rest of Region 6. Others may be required because of elevational or latitudinal requirements of stock. Selection of sites should be made within two years. Mill Creek on the Rogue River and Wind River on the Gifford Pinchot are under consideration.
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(3) Preparation	1959	1959-1964	Preparation of sites should start in 1959- in order to have orchards ready for first stock in 1960 or 1961.
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F. Supporting Work

(1) Development of techniques

Make sufficient tests in collaboration with R&W Station to check applicability of existing techniques and develop new ones as questions arise.

(2) Adaptability of rust-resistant sugar pine strains.

Testing as needed to be worked out as program develops and as material is available, in collaboration with PNW Station.

(3) Adaptability of rust-resistant western white pine strains.

Testing as needed to be worked out as program develops and as material is available, in collaboration with PNW Station.

(4) Improve vigor and quality of strains

Start when possible. Combine most suitable rust-resistant and other strains as shown by testing.

II. Development and Improvement of Strains of Species other than western white and sugar pine.

A. Search for and find plus trees and stands	1958	continuous	With particular attention to Douglas-fir, true firs and ponderosa pine search for and locate adequate numbers of plus trees of each species to fill needs for existing and planned seed orchards.
B. Protect plasm of plus trees	1958	continuous	Graft and transfer to out-plantings scions of each plus tree to protect against inadvertent loss. Establish archives.
C. Seed production from plus trees	1959	continuous	Make collections of seed from plus trees. Apply fertilizer and release to increase seed production.
D. Nursery	1960	continuous	Produce planting stock from plus tree seed.
E. Protect and preserve plus trees	1960	continuous	Sign and where necessary fence plus trees to give protection.

F. Mass hybridization
(Inter-specific)

1957

continuous

Cross pollinate between species or races as required. Follow procedures developed by research.

G. Seed orchards

1969

1959-
1969

Select seed orchard sites for all strains being developed.

III. Programming plans and designs of tests.

1958

1958-1959

Prepare plans for the various phases of the project. This is to be done in sufficient detail to provide for adequate progress toward achievement of the objectives. Design details of the tests in cooperation with PNW Station, adequate to accomplish results and susceptible of analysis.

IV. Analysis of Data

1958

continuous

Prepare analysis of data from tests.

V. Reports

1958

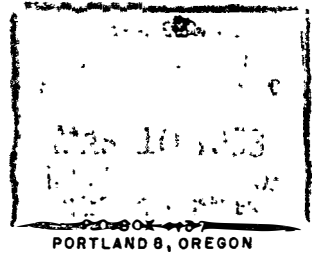
continuous

Report on results and progress.

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

PACIFIC NORTHWEST REGION



ADDRESS REPLY TO
REGIONAL FORESTER

AND REFER TO

S (BR) (PLANTING)
STUDIES
Rust-Resistant Pine

March 7, 1958

Mr. Richard T. Bingham
157 South Howard Street
Spokane, Washington

Dear Mr. Bingham:

Enclosed is a copy of our plan for the development of rust-resistant pines and improved strains of all species.

Your comments and suggestions will be appreciated. At the moment we are doing a job description and hope to have some one on the job by late spring. We would greatly appreciate having him work with you for a few days if at all possible.

Very truly yours,

Attachment

WALTER H. LUND
Assistant Regional Forester